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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/655,778
Filing Date: September 05, 2003
Appellant(s): BECK ET AL.

James A. Wilke
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 6, 2011 appealing from the Office action mailed February 25, 2011.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application:

Claims 17-19, 21, 23, 24, 26, and 69-73.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

WITHDRAWN REJECTIONS

The following grounds of rejection are not presented for review on appeal because they have been withdrawn by the examiner. The rejection of claims 17-19, 21, 23, 24, 26 and 69-73 under 35 U.S.C. 103(a) as being unpatentable over the Brickhead et al. reference (US Pub. No. 2002/0074127) in view of the Odachi et al. reference (US Pat. No. 6,869,272).

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

5,996,691	NORRIS ET AL.	12-1999
6,869,272	ODACHI ET AL.	3-2005
6,244,831	KAWABATA ET AL.	1-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 17, 18, 19, 21, 23-24, 26, and 69-73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Norris et al., US 5,996,691 in view of Odachi et al., US 6,869,272.

<u>In regard to independent claim 17:</u>

Norris discloses a method for controlling a progressing cavity pump 32 for transferring fluid within a fluid system (see fig. 1, col. 3, lines 26-35, a PCP pump that can be used for lifting any combination of oil, water and gas from a well formation), wherein the progressing cavity pump 32 is coupled to an electric motor 36, the method consisting of using sensors 38 that are located above ground level (col. 4, lines 52-54) to determine in real-time parameters of the pump operation and to calculate one or more values representing the performance of the progressing cavity pump (col. 4, lines 3—51, particularly fluid level and pump load). Norris does not teach the particulars of the claimed method drawn to determining in real-time values of torque and speed inputs to the progressing cavity pump by measuring motor voltage and current. However, Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage and current supplied to a motor 1 and uses this information to determine the speed via speed control unit 61. The measured current also determines the torque via torque control unit 52 (also see Abstract) and determines the load required of the compressor so that the torque and speed inputs can be adjusted by command signals to more efficiently run the compressor in response to the performance value corresponding to load (col. 1, line 63 - col. 2, line 27). The only inputs to determine the load on the compressor are the actual current and voltage. These inputs are used in a real-time basis to determine what the command speed and torque should be (constant speed or constant torque, low- or high- speed or torque) and are used in a closed loop system as seen in fig. 4. It would have been obvious to a

person having ordinary skill in the art to have modified the control system of Norris with the system of Odachi that identifies situations in which motor parameters need to be adjusted to keep the fluid transfer device operating efficiently.

In regard to independent claim 69:

Norris discloses a pump control system for controlling a progressing cavity pump 32 for transferring fluid within a fluid system (see fig. 1, col. 3, lines 26-35, a PCP pump that can be used for lifting any combination of oil, water and gas from a well formation), wherein the progressing cavity pump 32 is coupled to an electric motor 36, the control system including sensors 38 that are located above ground level (col. 4, lines 52-54) to determine in real-time parameters of the pump operation and to calculate one or more values representing the performance of the progressing cavity pump (col. 4, lines 3—51, particularly fluid level and pump load). Norris does not teach the particulars of the claimed pump system drawn to means for determining in real-time values of torque and speed inputs to the progressing cavity pump by measuring motor voltage and current. However, Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage and current supplied to a motor 1 and uses this information to determine the speed via speed control unit 61. The measured current also determines the torque via torque control unit 52 (also see Abstract) and determines the load required of the compressor so that the torque and speed inputs can be adjusted by command signals to more efficiently run the compressor in response to the performance value corresponding to load (col. 1, line 63 - col. 2, line 27). The only

inputs to determine the load on the compressor are the actual current and voltage. These inputs are used in a real-time basis to determine what the command speed and torque should be (constant speed or constant torque, low- or high- speed or torque) and are used in a closed loop system as seen in fig. 4. In particular, Odachi's motor control system is useful in determining the load on the compressor, and Norris is particularly interested in determining the load on the progressing cavity pump base don above ground sensors. It would have been obvious to a person having ordinary skill in the art to have modified the control system of Norris with the system of Odachi that identifies situations in which motor parameters need to be adjusted to keep the fluid transfer device operating efficiently.

In regard to claims 18, 19, 23 and 24:

Norris discusses using the control method to select a progressing cavity pump performance parameter to control (liquid level and rate of removal), determining a setpoint for the selected parameter (25% level as used in the example at col. 6, line 44 - col. 7, line 14), calculating a control signal using the setpoint value (all load determinations are made based on liquid level and rate of change of the liquid level) and thus calculating the command signals (see in general, Norris col. 6, line 44 - col. 7, line 14). Note that the combination of Norris and Odachi would control the pump as taught by Norris with taking the sensor data from the teaching of Odachi

In regard to claims 21 and 26:

Norris, though not explicitly disclosing that the pump parameter is pump head pressure, discloses that the pressure is adjusted by controlling the pump flow. Therefore, it would have been obvious to a person having ordinary skill in the art to have substituted setpoints and measurements for pressure head as opposed to pump flow to achieve the same, predictable, result of controlling the pump of Norris, particularly as Norris is primarily concerned with load on the pump and pressure head contributes to load. Note that Norris further teaches measuring the pressure with a sensor at ground level (col. 2, lines 46-54). The relationship between pump flow is such that regulating pump flow as a parameter would achieve substantially the same objective. Therefore, it would have been obvious to one of ordinary skill in the art to use pump flow as the performance parameter to be set and measured.

<u>In regard to claims 70-72:</u>

Norris in view of Odachi teach all of the limitations substantially as claimed, notably means for using progressing cavity pump performance values to produce one or more command signals for controlling the speed of the progressing cavity pump (Norris col. 6, line 44 - col. 7, line 14). Neither reference explicity discloses using the progressing cavity pump performance values to produce command signals includes means for calculating a feedback signal indicative of the difference between a current value of a selected progressing cavity pump performance parameter and a setpoint value of the selected progressing cavity pump performance parameter, and means for calculating the command signals from the feedback signal. However, feedback control

as described in the claimed limitations above are typical of elementary feedback control systems, such as the feedback control system for estimated speed input in Odachi et al. (see fig. 4). It would have been obvious to one of ordinary skill in the art that Norris, having sensors to measure actual production values and designed to set setpoint values, would use such feedback control as claimed by the applicant and broadly taught by Odachi.

Claim 73 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references applied to claim 69 above in view of Kawabata et al., 6,244,831.

Norris discloses all of the limitations substantially as claimed except means using the progressing cavity pump performance values to produce command signals includes means for calculating a feedforward signal by predicting a value of mechanical input to the progressing cavity pump when operating with a selected progressing cavity pump performance value at a setpoint value, and means for calculating the command signals from the feedforward signal.

As discussed above, Norris discloses sensors that measure actual performance values and is designed to set setpoint values, lending itself to feedback control. Kawabata teaches a feedforward control method for a pump, identifying a target value that undergoes a subtraction cycle that predicts deviation between a target value and a setpoint value to identify the proper setpoint value (col. 18, ll. 28-55), that would be obvious to one of the art to adapt to the control system of Norris to achieve the

predictable result of using feedforward control to predict and obviate deviations between setpoint and target values.

(10) Response to Argument

Applicant's invention is drawn to a pump control system for controlling a progressing cavity pump without the use of downhole sensors. Applicant claims a method for doing so in independent claim 17 and the apparatus for accomplishing this method in independent claim 69. The invention relies on means for determining in real-time values of torque and speed inputs to the progressing cavity pump by measuring electrical voltages applied to an electrical motor coupled to the progressing cavity pump to calculate one or more values representing the performance of the progressing cavity pump.

The rejection above and maintained in this examiner's answer relies upon the base reference to Norris et al., US 5,996,691, modified by the teachings of Odachi et al., US 6,869,272.

Norris teaches a pump control system for controlling a progressing cavity pump 32 for transferring fluid within a fluid system (see fig. 1, col. 3, lines 26-35, a PCP pump that can be used for lifting any combination of oil, water and gas from a well formation), wherein the progressing cavity pump 32 is coupled to an electric motor 36. The control system of Norris includes sensors 38 that are located above ground level (col. 4, lines 52-54) to determine in real-time parameters of the pump operation and to calculate one or more values representing the performance of the progressing cavity pump (col. 4, lines 3—51, particularly fluid level and pump load). Norris does not teach that the

measured parameters are motor voltage and current.used to determine torque and speed inputs to the progressing cavity pump. However, as discussed in the rejection above, Odachi teaches Odachi teaches a control method for controlling a motor driving a compressor wherein an estimation unit 51 measures voltage and current supplied to a motor 1 and uses this information to determine the speed via speed control unit 61. The measured current also determines the torque via torque control unit 52 (also see Abstract) and determines the load required of the compressor so that the torque and speed inputs can be adjusted by command signals to more efficiently run the compressor in response to the performance value corresponding to load (col. 1, line 63 - col. 2, line 27).It is this combination of references that make the rejections of the independent claims unpatentable under 35 U.S.C. 103 and which applicant argues against.

In response to applicant's argument that the rejected claims require more than a method of adjusting motor parameters to keep a fluid transfer device operating efficiently, as is presented as the reason for combining the Norris and Odachi references, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). In the present case, Norris teaches measuring the parameters of liquid level as it relates to the load of the progressing cavity pump. The load of a motor has a measurable relationship to its torque and speed, as a motor operating at zero load will achieve peak speed and a motor's maximum

available torque will determine its highest load capacity (as discussed by Norris in col. 4, lines 3-51 cited in the rejection when determining how to use a measured load to determine liquid level in real-time to properly control the pump). Therefore, the teaching of Odachi that measures current and voltage of the motor to determine torque and speed of the pump allows for an alternate method by which to determine the load of the pump of Norris would produce the predictable solution for determining pump load with a reasonable expectation of success.

Applicant also argues that the rejection failed to establish the level of ordinary skill in the art required. Note that the person having ordinary skill in the art is a legal fiction having "ordinary creativity" with "common sense" and capable of finding motivation "implicitly in the prior art" (See *KSR*, 550 U.S. 398). In the present case, the person having ordinary skill in the art would have made the connection between the teachings of Odachi relating to measuring torque and speed and the teachings of Norris computing motor load, as the relationship between torque, speed and load is within the knowledge of a person having ordinary skill in the art.

Applicant further argues that the combination includes some features from Odachi but ignores others, particularly the teaching that Odachi sets the motor at a constant torque for a set time, followed by setting the motor at a constant speed, which tends to teach away from the claimed invention. However, note that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the

test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

In this case, the primary reference to Norris teaches a progressing cavity pump substantially similar to that of the claimed invention that uses real-time parameters to control the load on the downhole pump, as discussed in the rejection above. Odachi teaches a control method for operating a motor for a compressor that associates the torque and speed of the motor with the load on the compressor. The load on the compressor of Odachi is derived from the sensed torque and speed of the motor. Note that Norris teaches the use of a complex computation including the weight of the pump and the torque rating of the motor driving the pump (the torque rating being the maximum torque the motor *can* operate at) coupled with a real-time measurement of the downward force on the pump to determine the real-time load on the pump. Odachi's teaching that measurements of voltage and current drawn by the motor may be used to derivethe torque and speed of the motor (and by extension, as one of ordinary skill in the art would be aware, the load on the motor) may be used to simplify the calculations required in Norris. One of ordinary skill in the art presented with these two references would recognize the usefulness of adapting the parameters of Odachi in the real-time control of Norris even though Odachi does not teach real-time control of the motor based on these parameters. By contending otherwise, applicant appears to be arguing against the references individually, as only Odachi alone fails to teach in real-time control. However, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642

F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). This applies to applicant's contention that Norris teaches away from the claimed invention by teaching the use of downhole sensors. Again, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Patrick Hamo/

October 14, 2011

Conferees:

/Devon C Kramer/

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/Kenneth B Rinehart/

Supervisory Patent Examiner, Art Unit 3743